1.) $f(x) = 4^{5x-3}$

$f'(x) = 4^{5x-3} \cdot \ln 4 \cdot 5$

$f'(0) = 4^{5(0)-3} \cdot \ln 4 \cdot 5$

$= 4^{-3} \cdot \ln 4 \cdot 5$

$= \frac{5\ln 4}{64}$

$f(0) = 4^{5(0)-3}$

$= 4^{-3}$

$= 1/64$

$(0, 1/64)$

$y - 1/64 = \frac{5\ln 4}{64}(x - 0)$

$y - 1/64 = \frac{5\ln 4}{64}x$

$y = \frac{5\ln 4}{64}x + \frac{1}{64}$

2a.) $y = e^{5x^2-3}$

$y' = e^{5x^2-3} \cdot 10x$

b.) $y = e^{\sin x}$

$y' = e^{\sin x} \cdot \cos x$

c.) $y = 8^{3x^4}$

$y' = 8^{3x^4} \ln 8 \ 12x^3$

d.) $y = \sin x \cdot e^{6x-1}$

$y' = \sin x\,(e^{6x-1})(6) + e^{6x-1}(\cos x)$

3a.) $y = 3x^2 e^{-1/2x}$

$\frac{dy}{dx} = 3x^2 e^{-1/2x} \cdot \left(\frac{1}{2x^2}\right) + e^{-1/2x}(6x)$

$= \frac{3}{2} e^{-1/2x} + 6x \cdot e^{-1/2x}$

$= e^{-1/2x}\left(\frac{3}{2} + 6x\right)$

b.) $y = \frac{1 + e^x}{x^2}$

$y' = \frac{e^x(x^2) - (1+e^x)(2x)}{x^4}$

$= \frac{x^2 \cdot e^x - 2x - 2x e^x}{x^4}$

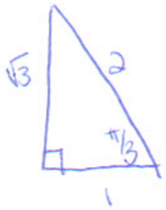
$= \frac{x(x \cdot e^x - 2 - 2e^x)}{x^4}$

5) $y = x - \tan x$

$y' = 1 - \sec^2 x$

$y' = 1 - \sec^2(\pi/3)$

$y' = 1 - \dfrac{1}{\cos^2(\pi/3)}$



$y' = 1 - \dfrac{1}{(1/2)^2}$

$= 1 - \dfrac{1}{(1/4)}$

$= 1 - 4$

$= -3$

$y = \dfrac{\pi}{3} - \tan(\pi/3)$

$= \dfrac{\pi}{3} - \sqrt{3}$

$\therefore \left(\pi/3, \pi/3 - \sqrt{3}\right)$

$y - \pi/3 + \sqrt{3} = -3\left(x - \pi/3\right)$

$= -3x + \pi$

$y = -3x + \pi + \pi/3 - \sqrt{3}$

$= -3x + \dfrac{4\pi}{3} - \sqrt{3}$

6) $m(t) = 5t(e^{-2t})$

$m'(t) = 5t(e^{-2t})(-2) + (e^{-2t})(5)$
$= 5e^{-2t}(-2t + 1)$

$0 = 5e^{-2t}(-2t + 1)$

$0 = -2t + 1$
$2t = 1$
$t = 1/2$

$m(1/2) = 5(1/2)e^{-2(1/2)} = \frac{2.5}{e}$

$m''(t) = 5e^{-2t}(-2) + (-2t+1)(5e^{-2t})(-2)$
$= -10e^{-2t}(1 + -2t + 1)$
$= -10e^{-2t}(-2t + 2)$

$m''(1/2) = -10e^{-2(1/2)}(-2(1/2) + 2)$
$= \frac{-10}{e}(1)$
$= \frac{-10}{e}$

NEG $\therefore$ Concave down
$\therefore$ max

$n(t) = 5t^2(e^{-t})$

$n'(t) = 5t^2(e^{-t})(-1) + e^{-t}(10t)$
$= -5t^2e^{-t} + 10te^{-t}$
$= -5te^{-t}(t - 2)$

$0 = -5te^{-t}(t-2)$

$0 = -5te^{-t}$ $\quad 0 = t - 2$
$0 = t$ $\quad t = 2$

$n''(t) = 5te^{-t}(-1) + (t-2)[-5te^{-t}(-1) + e^{-t}(-5)]$

$n''(0) = 0 + (0-2)[0 + e^{0}(-5)]$
$= -2(-5)$
$= 10$

Concave up $\therefore$ min

$n''(2) = 5(2)e^{-2}(-1) + (2-2)(\;\text{"}\;)$
$= \frac{-10}{e^2}$

Concave ~~up~~ down $\therefore$ ~~min~~ max

$n(0) = 0$

$n(2) = 5(2)^2(e^{-2})$
$= \frac{20}{e^2}$

$n(t)$ has a larger max, no, $n(t)$ is not always larger than $m(t)$.